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MATERIALS HANDLING SYSTEM

FIELD OF THE INVENTION

The present invention relates to a system for handling materials and in particular an environmentally sensitive system for economically transporting metropolitan waste to land fill sites.

BACKGROUND OF THE INVENTION

Metropolitan waste includes household garbage and the like. Its collection and disposal is a major expense for municipal councils. Typically, garbage trucks will periodically collect household garbage from the kerb side. When the truck is full, it will normally take the garbage to a transfer station. At the transfer station the garbage may be sorted to separate out any recyclables. The remaining refuse is crushed or baled in a compactor. The compressed refuse is then loaded into containers for transport to a land fill site by a semitrailer.

With the rapid growth of cities, the volume of metropolitan waste is increasing. Furthermore, there is an increasing tendency to move the land fill sites further from urbanised centres. This has required a proportional increase in the number of garbage trucks and regional transfer stations. However, the cost to municipal councils is increasing disproportionately relative to the increase in the number of rate payers as more heavy haulage trucks are required to transport the refuse the greater distance from the transfer station to the land fill site. This also involves greater indirect costs through the increased heavy haulage using the public road system.

In an attempt to address this, some regional transfer stations have balers or compactors that can directly engage the end of a container on the back of a semitrailer. Metropolitan waste from the garbage trucks is fed to the hoppers above the compactors

which compress the refuse directly into the container on the truck thereby removing the intermediate step of loading the compressed refuse into the heavy haulage truck. However in order to withstand the forces and pressures generated by the compressor, the container on the truck must be fabricated from relatively thick steel. This significantly increases the weight of the container and therefore to keep the load within the maximum permissible limit for public road usage, the containers must be relatively small. Accordingly, the volume of refuse transported is compromised. Large containers can be used if the trucks do not have to travel over public roads however this is not practical when the land fill site is a large distance from the transfer station.

One attempt to address this involves transferring large containers of compressed refuse from the back of heavy haulage trucks onto rail cars which have much greater weight limits. The container can then be transported by rail to a point at or near the land fill site where it can be loaded back onto a heavy haulage truck and emptied into the land fill.

This increases the volume of refuse in each container and takes the heavy haulage trucks off public roads, however transferring the containers from the trucks to the rail cars and then from the rail cars back to the trucks is time consuming and labour intensive.

SUMMARY OF THE INVENTION

It is an object of the present invention to overcome or ameliorate one of the problems of the prior art or at least provide a useful alternative.

Accordingly, in a first aspect the present invention provides a rail car including:

a chassis adapted to travel on a track;

a longitudinally extending container having a closeable opening for loading or unloading metropolitan waste material through at least one longitudinal end thereof;

means to enable interconnected displacement of the container relative to the chassis to permit loading via the closeable opening; and

the container being adapted to stably withstand the compression of the waste material within the container.

In a second aspect the present invention provides a materials handling system including:

a rail car having a chassis adapted to travel on a track;

a longitudinally extending container for compacted material, the container having a closeable opening for loading or unloading material through at least one longitudinal end thereof, and means to enable interconnected displacement of the container relative to the chassis to permit in situ loading via the closeable opening;

a loading means at a materials collection point for loading material into the container through the opening;

a track for the rail car extending from the collection point to a remote distribution point; and

an unloading means at the distribution point for unloading material from the container through the opening; wherein,

the container is displaced relative to the chassis to operatively engage the loading means and again displaced when unloading the material.

In a third aspect the present invention provides a method of transporting material between a collection point and a distribution point by rail using a rail car having:

a chassis adapted to travel on a track;

a longitudinally extending container having a closeable opening for loading or unloading material through at least one longitudinal end thereof; and

means to permit interconnected displacement of the container relative to the chassis to permit in situ loading via the closeable opening, said method including:

providing loading means at the collection point;

displacing the container relative to the chassis to operatively engage the loading means and loading material through the opening;

returning the container to its original position relative to the chassis and transporting the rail car along the track to the distribution point;

providing an unloading means at the distribution point; and

displacing the container relative to the chassis to operatively engage the unloading means and unloading the material.

In one preferred form, the means to enable interconnected displacement of the container relative to the chassis is a bearing between the container and the chassis such that the container is selectively rotatable relative to the chassis. In another preferred form, the material is loaded and unloaded through the closeable opening.

Preferably the material is metropolitan waste and the collection point is a regional transfer station wherein the loading means includes a compactor for compressing the waste. In this form stabilising means are provided to support and stabilise the rail car against forced generated by the compactor.

In a further preferred form, the distribution point is adjacent a land fill site and the unloading means is a hydraulically actuated telescopic ram capable of engaging the compressed waste through one opening in the container and pushing it out the opening in

the other end of the container. In a still further preferred form of this embodiment, the telescopic ram pushes the compressed waste out of the other end of the container into the trailer of a heavy haulage truck. Conveniently the trailer of the heavy haulage truck is provided with a conveyor means along its floor for unloading the waste into the land fill area.

BRIEF DESCRIPTION OF THE DRAWINGS

The present invention will now be described by way of example only with reference to the embodiments shown in the accompanying drawings in which:

Figure 1 shows a schematic elevation of a regional transfer station according to the present invention;

Figure 2 shows a plan view of the regional transfer station shown in Figure 1;

Figure 3 is a schematic elevation of the rail car being unloaded at the distribution point; and

Figure 4 is a plan view of the unloading operation at the distribution point.

DETAILED DESCRIPTION OF PREFERRED EMBODIMENTS

Referring to Figures 1 and 2, metropolitan waste is collected from the kerb side by garbage trucks 1 and taken to a regional transfer station 2. The garbage trucks 1 enter the transfer station 2 and unload the metropolitan waste onto a conveyor surface 14 which feeds the hoppers 3 of each compactor 4. From this point the process can be controlled from a control room (not shown) with a single operator. Automating the operation avoids human contact with refuse or equipment that has been in contact with refuse.

The transfer station is of split level construction. The compactor is fed by a suitable bi-directional conveyor surface such as those marketed under the trademark Walking Floor ® conveyor bunkers with hardened steel slats specifically designed for waste conveyance.

The compactor 4 crushes the waste material to minimise its volume. Preferably the hydraulic compactor 4 crushes the material such that it no longer has "memory". In this field "memory" describes the degree to which material resiliently returns to its original volume after being compressed.

A suitable compactor is the SP industries CP-13001 compactor which has a 10 cubic metre capacity. This gives the compactor a volume displacement of 567 cubic metres per hour under continuous operation and will load a 72 cubic metre container in 8 minutes. Based on a range between 390 kg per cubic metre for dry commercial refuse to 520 kg per cubic metre for wet residential refuse, one of these compactors will load 3 containers with a maximum of 37 tonnes of refuse per hour.

The outlet 5 of the compactor 4 is operatively engaged with the open end 11 of the container 6. The compressed waste material from successive garbage trucks 1 is progressively loaded into the container 6. The hydraulic ram (not shown) of the compactor 4 ensures that the container 6 is filled to capacity. Stabilising mounts 8 and 9 hold the container 6 firm against the forces exerted by the hydraulic ram of the compactor 4 during the loading process.

In the embodiments shown the container 6 is constructed from high tensile steel with 4 mm 3CR12-500 MPa stainless steel plate. Volume displacement is 72 cubic metres with feed container opening measuring 2.2 m wide by 2.6 m high.

The head of the compactor is designed with 3 vertical pinning tunnels (not shown) into which overhead pins (not shown) penetrate when the container is full. The pins limit the degree of memory in the compacted refuse.

When the container 6 is full, the open end 11 of the container is shut and the stabilising mounts 8 and 9 are disengaged. The container is then rotated on the bearing 10 back into alignment with the chassis 12 of the rail car 7 and locked into position. The rail car 7 may then be transported via track 13 to the remote distribution point.

It is envisaged that the life expectancy of the containers is 3 or 4 times that of a road vehicle compaction trailer. The compaction container can easily be removed for replacement or repairs. Tare weight of the compaction container is 8,200 kg with a load rating capacity to 40,000 kg. High capacity to 37 tonnes can be used where the processing plant or land fill is located in close proximity to rail and road transport on public roads is not required. Where public roads are utilised approximately 28 tonnes would be loaded unless special permits were available.

Depending on the rail corridor and the rating on the track, double container rolling stock can be used. The tare weight of a rail wagon suitable for 2 containers is approximately 24,000 kg. New wagons can be manufactured or existing rolling stock modified without difficulty.

Referring to Figures 3 and 4, unloading the waste from the rail cars 7 at or near the land fill site is equally as convenient. A spur of track 13 is provided at a location convenient to the land fill site. The rail cars 7 are positioned such that the end 11 of the container 6 can be operatively engaged with the hydraulic unloading ram 15. The container 6 is rotated on bearing 10 such that it aligns with the telescopic arm 16 of the

ram. Stabilising mounts 8 and 9 are engaged to provide the necessary resistance against the force of the ram 16. The ends 11 and 20 of the container 6 are opened so that the driving end 17 of the telescopic ram 16 can push the waste (not shown) out of the end 20 into the trailer of the truck 18.

The driving end 17 is self-aligning and runs on UHMW plastic bearings with sweepers (not shown) to completely clean the container 6. When the driving end 17 reaches its maximum stroke and begins to return misters located on the rear of the driving end commence spraying a fine mist of anti-bacterial deodorant.

Conveniently the floor of the trailer 19 is provided with a conveyor means such as a hydraulically powered slat type conveyor surface. A suitable surface is marketed under the trade mark Walking Floor®. Then it is a simple matter for the trucks to back the trailer up to the escarpment of the land fill site and simply convey the waste out of the trailer and over the edge of the escarpment.

It will be appreciated that a material handling system such as this has a number of inherent cost and time efficiencies. Through the use of a rail car having a container that rotates relative to the chassis many intermediate handling operations are removed. There is no need to load heavy haulage trucks at the regional transfer stations with containers filled with compressed metropolitan waste which are then in turn loaded onto rail cars and then similarly transferred back to trucks at the land fill site. The rail car according to the present invention allows the present system which removes the need for heavy haulage trucks on the roads in metropolitan areas. Heavy haulage trucks are used at the land fill sites, however these trucks will often not need to use public roads and therefore

the normal weight limits will not apply. Consequently, fewer trucks are required to transport the waste to the escarpment of the land fill.

It is envisaged that a materials handling system provides particular opportunities for efficient waste management in small towns and rural communities. Utilising existing methods the cost to small communities with low volumes of waste is enormous. High establishment costs for land fill in increasingly strict environment standards often results in sub-standard facilities which have difficulty meeting community expectations.

Using the present invention a small town transfer station could service a community of 5,000 and produce only one 25 tonne rail container every 2 days. The filled container may be collected by the train on its way to the major land fill. Conveniently the train would leave behind an empty container to replace the one it collects.

A community of 50,000 people would require 6 containers to be collected everyday at a facility staffed by a single operator. Furthermore, the establishment costs are relatively low and is easily adapted to incorporate a recycling and waste sorting facility.

The present invention has been described herein by way of example only and skilled workers in this field would recognise many variations and modifications which would not depart from the spirit and scope of the broad inventive concept.